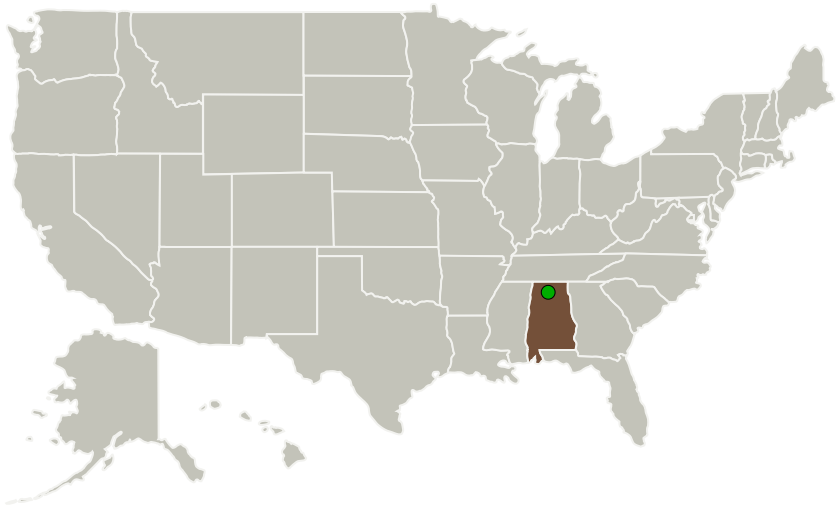
Fine Grained Tungsten Claddings for Cermet Based NTP Systems, Phase II

Completed Technology Project (2014 - 2018)

Project Introduction

In October 2011, NASA initiated the Nuclear Cryogenic Propulsion Stage (NCPS) program to evaluate the feasibility and affordability of Nuclear Thermal Propulsion (NTP). A critical aspect of the program is to develop a robust, stable nuclear fuel. One of the nuclear fuel configurations currently being evaluated is a cermet-based material comprised of uranium dioxide (UO2) particles encased in a tungsten matrix (W). To prevent excessive fuel loss from reaction with the hot hydrogen gas and uranium hydride formation, dense, fine-grained tungsten claddings are needed. Recently, advanced additive manufacturing techniques (EL-Form and Vacuum Plasma Spray Forming) have been developed that enable the deposition of coatings and near-net-shape refractory metal components with high density and tailored microstructures. The Phase I investigation produced fine-grained W claddings using EL-Form and VPS processing techniques. Testing showed the W claddings were well bonded to surrogate nuclear fuel element materials, and the W claddings were vacuum tight. During Phase II, the techniques developed during Phase I will be optimized, and W claddings on full size cermet fuel elements will be developed and characterized. Subscale and full-size test articles will be produced and delivered to NASA-MSFC for hot hydrogen testing in the Compact Fuel Element Environment Test (CFEET) facility and the Nuclear Thermal Rocket Element Environment Simulator (NTREES).

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

John O'dell

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Organizations Performing Work	Role	Type	Location
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

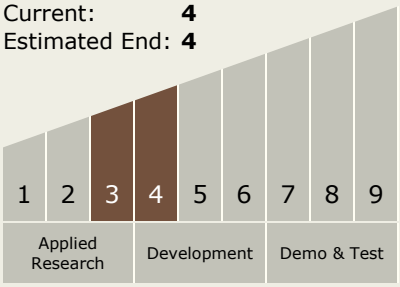
Primary U.S. Work Locations
Alabama

Images

Briefing Chart Image
Fine Grained Tungsten Claddings for Cermet Based NTP Systems, Phase II
(https://techport.nasa.gov/image/126014)

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.4 Advanced Propulsion
    - TX01.4.3 Nuclear Thermal Propulsion

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System